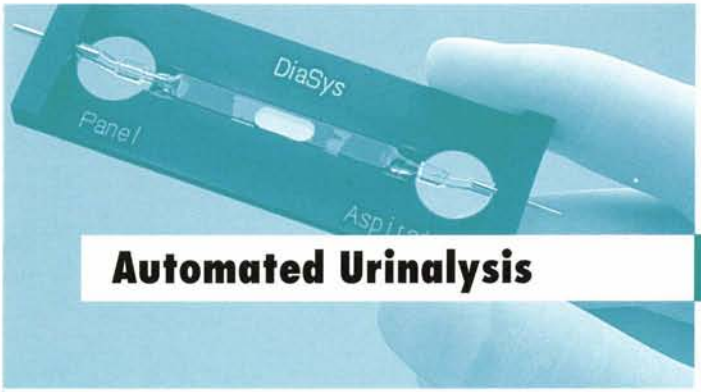

Automated Urinalysis

Health and Medicine

NASA *Tech Briefs* is a monthly publication that advises potential users what NASA-developed technologies are available for transfer and serves additionally as a problem-solving tool for its 200,000 industry and government readers (see page 129). Each issue reports on newly developed products and processes, and on innovative technologies originating in NASA research. Readers interested in adapting a particular innovation to their own purposes can get more detailed information from NASA by requesting a Technical Support Package (TSP).

Tech Briefs has become a prime source of spinoff applications. Sometimes the information in a *Tech Briefs* article, or a series of articles, is by itself sufficient to generate a spinoff product or to solve a problem related to a new development without need for the TSP. An example is the experience of DiaSys Corporation, Waterbury, Connecticut, which used *Tech Briefs* information to resolve a difficult problem involved in the development of the company's R/S 2000 instrument for automated urinalysis.

Conventional urinalysis is largely a manual process. Generally a sample of urine is poured into a tube and the tube is centrifuged for several minutes, creating a concentration of urine sediment at the bottom of the tube. Using a pipette, a thin plastic tube for transferring fluids, a sample of the sediment is deposited on a glass slide and the slide is topped with a cover slip to make a "glass sandwich." Then the slide is placed on a microscope stage for viewing.

The R/S 2000 automates most of that procedure. An operator — who needs no special training — inserts the R/S 2000's automatic aspirator into a standard tube of urine specimen and presses the "Sample" button. Within three seconds a consistent amount of sediment is automatically transferred to the stage of the microscope, ready for viewing. When observations are completed, the operator presses a "Flush" button and the system is purged; the sample/flush solution is deposited in the specimen tube, from which the urine was initially drawn; the tube is then discarded.

Below, DiaSys president Todd M. DeMatteo (standing) discusses the operation of the R/S 2000 with a laboratory pathologist. In the background, product inventor Walter Greenfield confers with a lab technician. **At right** is the complete R/S 2000 system, including the slide

(foreground), the pump unit **(center photo)** and the test tube racks. **At right** is a closeup view of the slide, which fits any microscope. **The lower photo** compares the DiaSys slide (black) with current method equipment, including microscope slide, cover slip and pipettes, all of which must be discarded as "red bag" waste. The instrument, DiaSys officials say, "speeds up, standardizes, automates and makes safer the analysis of urine." It eliminates the use of pipettes, slides and slide cover slips, it improves the accuracy and reproducibility of analysis, and it reduces exposure to potentially infectious materials.

The fluid sample is delivered to the microscope by a peristaltic pump connected by tubing to a proprietary optical slide assembly (OSA) located on the stage of the microscope. In the course of developing the OSA, it became apparent that pumped fluids, under a magnification of 400X, exhibited radically different characteristics from fluids deposited manually on a glass slide by a pipette. In early OSAs, particulate matter tended to collect and bunch up within the cell chamber, obscuring view and rendering the specimens unacceptable. The problem resisted solution through several modifications.

Then Walter Greenfield of DiaSys discovered several pertinent articles in *Tech Briefs*, in particular descriptions of work performed by Jet Propulsion Laboratory on hydrodynamic stability and by Langley Research Center on a wind tunnel technique for studying the flow of fluid over a surface by use of multilayered, multicolored coatings. That, says DiaSys' president Todd DeMatteo, provided the key to solving the OSA problem.

"The *NASA Tech Briefs* articles led us to aerospace studies on fluid dynamics, especially those with regard to the characteristics of airflow and how it parallels fluid motion. We found that biological fluids actually behave like air in a controlled system like the R/S 2000. Taking advantage of the information presented, we were able to design the OSA to be aerodynamically — and therefore fluid-dynamically — correct."

DiaSys patented the R/S 2000 and introduced it to the market. DiaSys is now developing several additional products based on the same technology, products designed to automate and standardize laboratory procedures used in microscopic examination and manipulation of other body fluids, such as feces, sperm and blood.